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(71)(72) Applicant and Inventor: KELLEHER, Brian, S. [US/US]; 733 Genter Street, La Jolla, CA 92037 (US).

(74) Agents: BERG, Richard, P. et al.; Laddas & Parry, Suite 2100, 5670 Wilshire Boulevard, Los Angeles, CA 90036-5679 (US).

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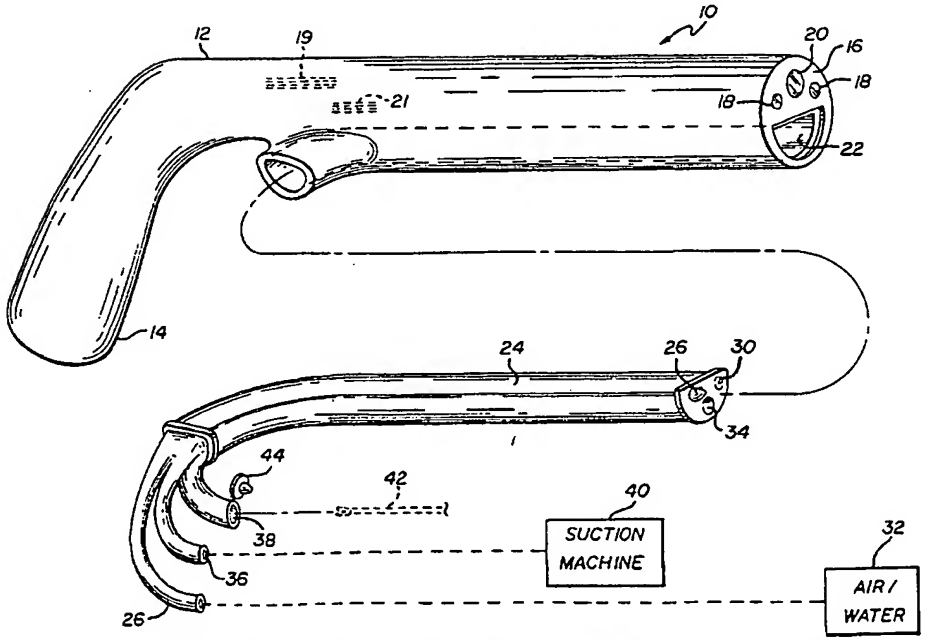
(57) Abstract

An endoscope (10) for insertion into a patient's inner body cavity has a shell (12) with apertures (18, 20) for 1) illuminating a lens and 2) passing light from an imaging (or objective) lens, each lens being disposed on the distal face of the shell. The shell (12) also has an aperture (22), preferably off-round, for receiving a resilient disposable core (24). The resilient core has passageways for introducing a pressurized fluid (e.g. air or water) to selective ones of the lenses to clean the lenses. The core may also have another passageway for removing material from the patient's inner body cavity for analysis. This passageway may communicate with two (2) conduits for removing specimens from the body cavity (1) as by a vacuum (36) or 2) as by an instrument (38). The second conduit may be closed except when the instrument is to be inserted into the patient's inner body cavity. The core may be drawn through the shell aperture to position the core in the aperture. A cleaning member may be attached to the core to clean the shell aperture as the core is drawn through the aperture. Alternatively, a leader applied to the core may be drawn with the core through the shell aperture and then removed from the core. Sealing members attached to the core may also be drawn through the aperture with the core to seal the core. Alternatively, members may be sealed to the core or shell after the sealing operation. A cover on a core end may alternatively be removed after the core has been drawn through the shell aperture.



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ENDOSCOPE

TECHNICAL FIELD OF THE INVENTION

This invention relates to endoscopes for inspecting inner cavities of a patient's body, particularly those associated with the gastro-intestinal tract. More particularly, the invention relates to an endoscope with a disposable core for minimizing the cost, and facilitating the ease, of examining the inner cavities of the patient's body. The endoscope of this invention is particularly advantageous in minimizing any likelihood of cross contaminating successive patients.

BACKGROUND OF THE INVENTION

The examination of the inner cavities of a patient's body for evidences of cancer, and for polyps which sometimes lead to cancer, is becoming increasingly common. Endoscopes are employed to make such examinations. One type of endoscope employs a video sensor in the distal tip section, which sensor electrically senses the image as by a charge coupled device and sends information relating to the sensed image from the charge coupled device through a set of wires to processing and display means outside the endoscope.

Another type of endoscope generally includes at least one illuminating lens on a display face of the endoscope to illuminate the portion of the inner body cavity being inspected and also includes an imaging lens for receiving the image from the illuminated portion of the inner body cavity. Optical fibers are provided in this type of endoscope for introducing light to the illuminating lens and for receiving light from the imaging lens. The endoscopes also have passageways for obtaining specimens from the inner cavities of the patient's body such as the patient's colon. These passageways provide for obtaining specimens from the patient's inner body cavity as by suction or vacuum or as by an instrument such as forceps. The passageways may be used for other purposes such as polyp snaring, cauterizing or ablation

as by lasers.

There are certain inherent limitations or disadvantages in the endoscopes now in use. One inherent disadvantage or limitation is that the endoscopes tend to provide cross contamination from a first patient to a second patient when an examination is made initially of the inner body cavity of the first patient and then of the second patient. Elaborate procedures are performed on an endoscope to clean and disinfect the endoscope after each examination of a patient's inner body cavity but such elaborate procedures are not always effective, especially with respect to cleaning the inner passageways.

To overcome the problems discussed in the previous paragraph, endoscopes have been made modular. For example, the shell holding the lenses and passageways described in the previous paragraph has been made disposable. After the inner cavity such as the colon of an individual patient has been examined, the shell has been removed and discarded. The endoscope has then been cleaned and a new shell has then been disposed on the endoscope for the examination of another patient's inner body cavity.

The procedure described in the previous paragraph has been cumbersome and expensive, particularly since the illuminating and imaging lenses have been included in the disposable shell. With the efforts now being made to limit the costs of medical procedures, endoscopes with disposable shells are becoming progressively undesirable. Furthermore, it has been found necessary to disinfect the endoscope even after the shell has been removed from the endoscope due to contamination of other parts of the endoscope not protected by the shell.

BRIEF DESCRIPTION OF THE INVENTION

This invention provides an endoscope which overcomes the above disadvantages. The invention includes a disposable core which is removably disposed in an aperture in a shell.

The disposable core is removable from the shell aperture after an inspection of an individual's inner body cavity, and the shell aperture is cleaned. Another core is then disposed in the shell aperture for an inspection of the inner body cavity of a second patient. The disposable core of this invention may be provided with features for cleaning the shell aperture as the core is drawn into the shell aperture.

In one embodiment of the invention, an endoscope for insertion into a patient's inner body cavity has a resilient shell with apertures (1) for illuminating an illuminating lens and (2) for passing light from an imaging (or objective) lens, each lens being disposed on the distal face of the shell. The shell also has an aperture, preferably off-round, for receiving a resilient disposable core. The disposable core has passageways for introducing a pressurized fluid (e.g. air or water) to selective ones of the lenses to clean the lenses.

The core may also have another passageway for removing material from the patient's inner body cavity for analysis. This passageway may communicate with two (2) conduits for removing specimens from the colon (1) as by a vacuum and (2) as by an instrument. The second conduit may be closed except when the instrument is to be inserted into a patient's inner body cavity.

The core may be drawn through the shell aperture to position the core in the aperture. A cleaning member may be attached to the core to clean the shell aperture as the core is drawn through the aperture. Alternatively, a leader applied to the core may be drawn with the core through the shell aperture and then removed from the core.

Sealing members attached to the core may also be drawn through the aperture with the core to seal the core to the shell at each end so as to prevent contamination from leaking into the aperture. Alternatively, members may be sealed to the core or shell after the drawing operation. A cover on a core end may alternatively be removed after the

core has been drawn through the shell aperture.

BREIF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic exploded perspective view of an endoscope having disposable features and constituting one embodiment of the invention;

Figure 2 is an enlarged side elevational view of certain features of a shell included in the embodiment shown in Figure 1;

Figure 3 is an enlarged side elevational view of certain features of a core included in the embodiment shown in Figure 1;

Figure 4 is an enlarged side elevational view similar to the views shown in Figures 2 and 3 but with the core disposed in an aperture in the shell;

Figure 5A is an enlarged sectional view of one embodiment including a shell and a core after the core has been disposed in the shell aperture but before the shell has been sealed to the core;

Figure 5B is a view similar to that shown in Figure 5A after the shell and the core shown in Figure 5A have been sealed;

Figure 6A is an enlarged sectional view of a second embodiment including a shell and a core after the core has been partially disposed in the core and before the shell and the core have been sealed;

Figure 6B is an enlarged sectional view similar to that shown in Figure 6A after the core has been disposed in the shell and the shell and the core have been sealed;

Figure 7A is an enlarged sectional view of a third embodiment including a shell and a core after the core has been partially disposed in the shell and before the shell and the core have been sealed;

Figure 7B is an enlarged sectional view similar to that shown in Figure 7A after the core has been disposed in the shell and the shell and the core have been sealed;

Figure 8A is an enlarged sectional view of a fourth embodiment including a shell and a core after the core has been partially disposed in the shell and before the shell and

the core have been sealed;

Figure 8B is a enlarged sectional view similar to that shown in Figure 8A after the core has been disposed in the shell and the shell and the core have been sealed;

Figure 9A is an enlarged exploded sectional view of a fifth embodiment including a shell and a core after the core has been partially disposed in the shell and before the shell and the core have been sealed;

Figure 9B is an enlarged sectional view similar to that shown in Figure 9A after the core has been disposed in the shell and after the core and the shell have been sealed;

Figure 10A is an enlarged sectional view of a sixth embodiment including a shell and a core after the core has been disposed in the shell but before the shell and the core have been sealed;

Figure 10B is an enlarged sectional view of the shell and the core shown in Figure 10A after the shell and the core have been sealed;

Figure 11 is an enlarged sectional view of a shell and a core included in a seventh embodiment of the invention after the core has been partially drawn through the shell;

Figure 12 is an enlarged sectional view of a shell and a core included in an eighth embodiment of the invention after the core has been partially drawn through the shell;

Figure 13 is an enlarged sectional view of a shell and a core included in a ninth embodiment of the invention after the core has been partially drawn through the shell;

Figure 14 is an enlarged sectional view of a shell and a core included in a tenth embodiment of the invention after the core has been partially drawn through the shell; and

Figure 15 is a fragmentary sectional view of another embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

In one embodiment of the invention shown in Figures 1-4, an endoscope generally indicated at 10 is provided. The endoscope 10 includes a shell 12 made from a suitable material well known in the art. For example, the shell 12 may be made from thin strips of a helically coiled metal covered by a

suitable material such as rubber, and a resilient material may be provided at the inner surface of the shell. The shell has a handle 14 which is shaped to be manually grasped. At its distal end (the end invading the patient's inner body cavity), the shell 12 has a face 16.

A pair of illuminating lenses 18 are disposed on the distal face 16. The illuminating lenses 18 may be constructed in a conventional manner. The illuminating lenses 18 may communicate as by optical fibers 19 through the handle 14 to an external light source in a manner well known in the art. The illuminating lenses 18 may be symmetrically disposed on the distal face 16. The illuminating lenses 18 are disposed to illuminate a portion of the patient's inner body cavity to be examined. Although two (2) illuminating lenses are shown in Figures 1, 2 and 4, it will be appreciated that one (1) and more than two (2) illuminating lenses may be provided on the distal face 16.

An imaging (or objective) lens 20 is also disposed on the distal face 16. The imaging lens 20 may be constructed in a conventional manner and may be preferably disposed between the illuminating lenses 18. The imaging lens 20 is constructed and disposed to provide an image of the portion of the patient's inner body cavity being examined. The imaging lens 20 may communicate as by optical fibers 21 through the handle 14 to an external viewing or display apparatus. This communication may be as by optical fibers 21 (in the case of a fiberoptic endoscope) or as by electrical wires (in the case of a video endoscope).

The shell 12 has an aperture 22 extending longitudinally through the shell. Preferably the aperture 22 has an off-round configuration in section. By providing the aperture 22 with an off-round configuration, a core 24 may be disposed tightly in the aperture in only one particular relationship. This is particularly true when the core 24 has an off-round configuration in section corresponding to the off-round configuration of the aperture 22. The core 24 may

be made from a resilient material well known in the art. A lubricant may be provided on the external surface of the core 24 to facilitate the proper disposition of the core in the aperture 22 of the shell 12. Alternatively, a thin film of lubricant may be disposed on the surface defining the aperture 22 in the shell 12 to facilitate the proper disposition of the core 24 in the aperture.

A passageway 26 communicates with an external fluid pressurizing apparatus 32 at one end and with the distal face 16 of the core 24 at the other end to receive and pass the pressurized fluid from the external apparatus. This pressurized fluid may be air or water. The pressurized fluid in the passageway 26 may be introduced to the imaging lenses 18 to clean the imaging lenses.

In like manner, a passageway 30 may be disposed longitudinally in the core 24 to communicate with the external fluid pressurizing apparatus 32 at one end and with the distal face 16 at the other end. Pressurized fluid such as air or water flows through the passageway 30 to rinse tissues in the field of view or to inflate such areas with gas. It will be appreciated that the passageways 26 and 30 may actually constitute a single passageway. The pressurized fluid such as air or water may also dry the lens 20.

A passageway 34 is also disposed longitudinally in the core 24 in communication with the distal face 16. The passageway 34 may communicate with a pair of conduits 36 and 38 at the proximal end of the core (the end near the handle 14). The conduit 36 is adapted to receive a vacuum from a suction machine 40 to suction material such as specimens or debris from the inner body cavity at the position being inspected. The conduit 38 is adapted to receive an instrument such as forceps 42 in a conventional manner to snip specimens from the patient's inner body cavity at the position being inspected. A plug 44 may be attached to the wall of the conduit 38 to close the conduit when a vacuum is provided in the conduit 36. Alternatively, a rubber diaphragm with a

small self-sealing hole or slit may be stretched across the opening in the conduit 38 in place of the plug 44, as is well known in the art. An instrument such as the forceps 42 or the like may be inserted through the self-sealing hole or slit, which will stretch to accommodate the diameter of the forceps.

Before the core 24 is disposed in the aperture 22, the shell 12 is cleaned with water and also preferably with a disinfectant. The disinfectant is well known in the art. The cleaning and disinfecting may be provided on the external surface of the shell 12 and also in the aperture 22. The cleaning and disinfecting are provided to insure that a second patient receiving an examination of an inner body cavity with the endoscope 10 cannot be cross contaminated by a first patient whose inner body cavity was previously examined with the endoscope. Preferably the core 24 has been previously disinfected at the time of its manufacture and has been sealed after being disinfected. If the core 24 has not previously been disinfected, it should be disinfected before insertion into the aperture 22.

Figures 5-10 illustrate different arrangements for sealing the core 24 in the aperture 22 of the shell 12. Although Figures 5-10 illustrate arrangements for sealing the core at the distal opening of the aperture, it will be appreciated that similar arrangements may be made at the proximal opening of aperture 22. Although a number of sealing arrangements are shown in Figures 5-10, it will be appreciated that a number of other sealing arrangements may be provided without departing from the scope of the invention. The embodiments shown in Figures 5-10 are accordingly illustrative only.

Figure 5A illustrates the shell 12, the aperture 22 in the core 24 after the core 24 has been properly disposed in the aperture but before the shell and the core have been sealed. Figure 5B illustrates the shell 12 and the core 24 after they have been sealed. As will be seen, the seal is

provided by a ring 50 tightly disposed on the shell 12 to compress the inner end of the shell against the core 24.

In Figure 6A, the core 24 has been partially inserted into the aperture 22 in the shell 12. After the core 24 has been properly inserted into the aperture 22 in the shell 12, an inflatable ring 52 on the core is inflated to expand into engagement with the wall of the aperture 22. A seal is accordingly produced between the core 24 and the aperture 22 of the shell 12 as indicated schematically in Figure 6B. It will be appreciated that the inflatable ring 52 may be disposed on the shell 12 in the aperture 22 to expand inwardly against the core 24 when inflated.

The core 24 has also been partially inserted into the aperture 22 of the shell 12 in Figure 7A. In this embodiment, the shell 12 is provided with a flap 54. When the shell 12 has been properly disposed in the aperture 22 of the shell 12, the flap 54 presses against the core 24 to seal the shell and the core. This is shown in Figure 7B. As will be appreciated, the flap 56 may be formed from a cut in the internal surface of the shell as shown in Figures 7A and 7B or it may be formed from a flange extending longitudinally from the shell into the aperture 22 in the shell at a position past the distal end of the shell. A similar flap or flange may be formed on the external periphery of the core 24 instead of on the shell 12.

Figures 8A and 8B illustrate another sealing embodiment. As shown in Figure 8A, an O-ring 56 is seated in a socket 58 in the core 24. The core is shown in Figure 8A after it has been partially disposed in the aperture 22 of the shell 12. The O-ring 56 becomes disposed in a socket 60 in the aperture 22 of the shell 12 after it has been fully inserted into the socket. This is shown in Figure 8B.

A person of ordinary skill in the art will appreciate that the O-ring 56 may be seated in the shell

instead of in the core. Such a person will also appreciate that the socket 60 does not have to be provided in the embodiment shown in Figures 8A and 8B. Alternatively, the 0-ring 56 can be molded into the shell 12 or the core 24.

In Figure 9A, the core 24 is shown as being partially disposed in the aperture 22 of the shell 12. When the core 24 has been fully disposed in the aperture 22 of the shell 12, a ring 62 is disposed in a socket 64 in the distal face of the core 24 to expand the core against the wall of the aperture 22 as shown in Figure 9B. As will be appreciated, a ring corresponding to the ring 62 may alternatively be inserted into a socket in the shell 12 to expand the shell against the core.

In Figure 10A, the core 24 is shown as having been partially inserted into the aperture 22 of the shell 12. As shown in Figure 10A, the core 24 is inserted into the shell 12 from the distal end. Upon a full insertion of the core 24 into the shell 12, a collar 66 on the core fits snugly into a socket 68 in the shell. A sleeve 70 on the core 24 is then slid on the core in a distal direction to mate with a socket 72 in the aperture 22 of the shell 12. As will be seen, a protuberance 74 on the inner wall of the shell 12 then mates with a detent portion 76 on the sleeve 70. The mating relationship is shown in Figure 10B.

Figures 11-14 illustrate different arrangements for inserting the core 24 into the aperture 22 in the shell 24. A number of core configurations and insertion alternatives are shown in Figures 11-14.

For example, Figure 11 schematically shows an embodiment in which the core 24 is pulled in the distal direction as by a cord 80 through the aperture 22 in the shell 12. A collar 82 is disposed on the distal end of the core 24. When the distal end of the core 24 has been pulled to the distal end of the shell 12, the collar 82 becomes disposed in

a socket 84 in the shell 12 in a tight fitting relationship.

Figure 12 schematically shows another arrangement for passing the core 24 through the aperture 22 in the shell 12. In the embodiment shown in Figure 12, a rod 90 having a bulbous configuration 92 at its distal end is disposed in the aperture 22 in engagement with the core 24. When the rod 90 is moved in the distal direction, it moves the core 24 in the distal direction. When the distal end of the core 24 reaches the distal end of the shell 12, a collar 94 at the distal end of the core fits tightly in a socket 96 in the aperture 22 at the distal end of the shell. The rod 90 is then withdrawn in the proximal direction from the core 24.

Figure 13 shows an arrangement similar to that shown in Figure 12. However, the arrangement shown in Figure 13 includes a cover 98 for the collar 94. In this arrangement, the core 24 is moved in a distal direction through the aperture 22 in the shell 12 until the collar 94 overshoots the socket 96. This causes the collar 94 to be disposed in free space. The cover 98 is then removed from the collar 94 and the core 24 is moved in the proximal direction until the collar 94 fits tightly in the socket 96. In this way, the distal face of core 24 does not become contaminated if there should be any contaminant in the aperture 22.

In Figure 14, a cord 100 is provided corresponding to the cord 80 in Figure 11. However, in Figure 14, a sponge 102 is attached through the cord 100 to the core 24. The sponge 102 may be filled with a disinfectant and may be provided with a diameter slightly greater than that of the aperture 22. As the core 24 is moved in the distal direction through the aperture 22 of the shell, it engages the wall of the aperture and cleans and disinfects this wall. This provides further assurance that the endoscope is sanitary before it is applied to a patient's inner body cavity.

Figure 15 schematically illustrates another embodiment of the invention. In this embodiment, a charge

coupled device 120 (well known in the art) is disposed in back of the imaging or objective lens 20 to produce signals in accordance with the light incident on the imaging or objective lens 20. The charge coupled device 120 is connected to wires 122 which extend through the handle 16 to an external viewing or display apparatus.

The endoscope 10 constituting this invention has certain important advantages. It provides a core 24 which is disposable in an aperture 22 in a shell 12. In this way, the core 24 can be removed after use and replaced with a disinfected core. The endoscope 10 is also advantageous in that the shell 12 can be easily cleaned and disinfected after each use and after the core has been removed from the shell. The core 24 can be easily sealed in the shell 12 in a number of different ways after it has been properly inserted in the shell. The provision of a disposable core 24 is also advantageous in that it minimizes the cost of providing successive endoscopes.

Although this invention has been disclosed and illustrated with reference to particular embodiments, the principles involved are susceptible for use in numerous other embodiments which will be apparent to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

_C_L_A_I_M_S_

1. In combination for use in an endoscope to inspect or apply therapy to an inner body cavity,

a shell,

illuminating means in the shell,

imaging means in the shell, and

a core removably disposed in the shell in sealing relationship with the shell,

the core including a first passageway for providing for a removal of materials from the inner body cavity.

2. In a combination as set forth in claim 1,

the core including a second passageway for applying a fluid to selected areas of the shell or inner body cavity of the patient to clean such selected areas or to inflate such cavity with gas.

3. In a combination as set forth in claim 1,

the core including a second passageway for applying a fluid to the imaging lens to clean the imaging lens.

4. In a combination as set forth in claim 1,

means disposed on at least one of the core and shell for sealing the core in the shell at the openings of the aperture.

5. In a combination as set forth in claim 1,

there being in the shell an aperture with an off-round configuration in section,

the core being provided with an off-round configuration in section corresponding to the off-round configuration of the aperture in the shell.

6. In combination for use in an endoscope to inspect or apply therapy to an inner body cavity,

a shell made for insertion into the inner body

cavity, the shell having a distal face,

illuminating means disposed on the distal face of the shell,

imaging means disposed on the distal face of the shell in spaced relationship to the illuminating means,

there being an aperture in the shell,

a core removably disposed in the aperture in the shell,

first means for sealing the core in the aperture in the shell,

second means disposed in the core for cleaning at least one of the illuminating means and the imaging means in the shell, and

third means disposed in the core for providing for the removal of materials from the inner body cavity.

7. In a combination as set forth in claim 6,

the second means providing for the introduction of a fluid to the imaging means to clean the imaging means, dry the imaging means or inflate the field of view in the inner body cavity.

8. In a combination as set forth in claim 6,

the third means including a first conduit for removing material from the inner body cavity as by suction and including a second conduit for providing for the passage of instrumentation into the inner body cavity of a patient.

9. In a combination as set forth in claim 8,

means for sealing the second conduit except when the instrumentation is to be inserted in the inner body cavity.

10. In combination for use in an endoscope to inspect or apply therapy to an inner body cavity of a patient,

a shell having a face at its distal end,

illuminating means on the face at the distal end of the shell for illuminating a particular portion of the internal body cavity to be inspected,

imaging means disposed on the face at the distal end

of the shell for receiving the image of the particular portion of the internal body cavity to be inspected,

there being an aperture in the shell in spaced relationship to the illuminating means and the imaging means,

a core disposed in the shell aperture,

first passageway means disposed in the core for introducing a fluid to at least one of the imaging means and the illuminating means to clean or dry such means or for introducing a fluid to the particular portion of the internal body cavity to clean the particular portion for inspection or to inflate the cavity with gas, and

second passageway means disposed in the core in spaced relationship to the first passageway means for providing for the passage of instruments or removal of materials from the particular portion of the inner body cavity.

11. In a combination as set forth in claim 10,

means for sealing the core in the shell at the openings of the aperture and for providing for the removal of the core from the shell after the use of the shell and the core to inspect or apply therapy to the particular portion of the patient's internal body cavity.

12. In a combination as set forth in claim 10,

means for sealing the core in the shell at the openings of the aperture, and

means for cleaning the aperture in the shell during the insertion of the core into the aperture.

13. In a combination as set forth in claim 10,

the second passageway means having first and second conduit means at the proximal end,

the first conduit means being constructed to become closed when a vacuum is to be applied through the second conduit to remove materials from the patient's inner body cavity.

14. In a combination as set forth in claim 13,

the second conduit means being constructed to receive a vacuum to remove materials from the inner body cavity, and

means for closing the first conduit means except when an instrument is inserted through the first conduit means.

15. In combination for use in an endoscope to inspect or apply therapy to an inner body cavity of a patient where the endoscope includes a shell with an aperture and a distal face and illumination means and imaging means on the distal face,

a core made from a resilient material and shaped to fit into the aperture in the shell,

the core having a first passageway for receiving a fluid under pressure to clean at least one of the illuminating means and imaging means on the distal face of the shell and having a second passageway for providing for the removal of material from the inner body cavity, and

means associated with the core for sealing the core in the shell aperture.

16. In a combination as set forth in claim 15,

the first passageway being adapted to pass a selective one of air and water under pressure to the distal end of the core for cleaning at least one of the illuminating means and the imaging means on the shell.

17. In a combination as set forth in claim 15,

the second passageway including a first conduit for receiving a vacuum for removing material from the patient's inner body cavity by suction and including a second conduit for receiving an instrument.

18. In a combination as set forth in claim 15,

means disposed on the core for separating the second passageway into a first conduit for receiving a vacuum end into a second conduit for receiving an instrument, and

means associated with the second conduit for sealing

the second conduit except when the instrument is inserted into the second conduit.

19. In a combination as set forth in claim 15,

means attached to the core for cleaning the aperture in the shell during the insertion of the core into the aperture in the shell.

20. In a combination as set forth in claim 15,

means disposed in co-operative relationship with the core for sealing the core in the aperture in the shell after the insertion of the core into such aperture.

21. In a combination as set forth in claim 15,

means disposed in co-operative relationship with the core for facilitating the insertion of the core into the aperture in the shell.

22. In a combination as set forth in claim 21 wherein

the facilitating means is removable from the co-operative relationship with the core after the insertion of the core into the aperture in the shell.

23. In combination for use in an endoscope to inspect or apply therapy to an inner body cavity of a patient where the endoscope includes an off-round aperture and also includes a distal face and includes illuminating means and imaging means on the distal face,

a core made from a resilient material and having an off-round external periphery corresponding to the off-round aperture in the shell,

a first passageway extending longitudinally through the core for passing a fluid under pressure to at least one of

the illuminating means and the imaging means on the distal face of the shell,

a second passageway extending longitudinally through

the core to provide for the removal of material from the inner body cavity or the passage of instruments, and

means for sealing the distal end of the core in the aperture in the shell.

24. In a combination as set forth in claim 23,

the sealing means including means separable from the core for sealing the distal end of the core in the aperture in the shell after the core has been disposed in the aperture.

25. In a combination as set forth in claim 23,

means attached to the core and movable with the core through the aperture in the shell for cleaning the aperture in the shell during the insertion of the core in the aperture in the shell.

26. In a combination as set forth in claim 23,

the first passageway being disposed in the core to direct fluid under pressure to the illuminating means, and

a third passageway disposed in the core to direct fluid under pressure to the imaging means.

27. In a combination as set forth in claim 23,

means for facilitating the insertion of the core into the aperture in the shell.

28. In a combination as set forth in claim 23,

the second passageway defining first and second conduits at a position displaced from the shell in the proximal end of the core,

the first conduit receiving a vacuum and introducing the vacuum to the inner body cavity through the second passageway for removing material from the inner body cavity,

the second conduit receiving an instrument and passing the instrument through the second passageway for removing material from the inner body cavity, and

means for closing the second conduit except when the second conduit is to receive the instrument.

29. In a method of inspecting and applying therapy to a patient's inner body cavity and of removing material from the patient's inner body cavity, including the following steps:

providing a shell having illuminating means and imaging means at a distal end and having an aperture extending longitudinally through the shell,

providing a resilient core having an external periphery configured to conform to the aperture in the shell and having at least a first passageway extending longitudinally through the core for applying a fluid under pressure to at least one of the illuminating means and the imaging means and having a second passageway extending longitudinally through the core for providing for the removal of material from the patient's inner body cavity,

cleaning the external surface of the shell and the surface in the aperture of the shell,

thereafter disposing the core in the aperture in the shell, and

sealing the core in the shell after the desired positioning of the core in the shell.

30. In a method as set forth in claim 29, including the steps of:

providing a resilient cleaning member at one end of the core,

moving the core and the cleaning member through the aperture in the shell to provide a cleaning of the aperture in the shell during the insertion of the core in the aperture in the shell.

31. In a method as set forth in claim 29 wherein

the core is drawn through the aperture in the shell and a member is then activated in a particular one of the core and the shell to seal the core in the shell after the core has been drawn through the aperture in the shell.

32. In a method as set forth in claim 29 wherein

a leader is applied to the core and the leader is then drawn through the aperture in the shell with the leader applied to the core and the leader is withdrawn from the core after the leader and the core have been drawn through the aperture in the shell.

33. In a method as set forth in claim 29,

sealing means are applied to the distal end of the core and the core is then drawn through the aperture in the shell to a position where the sealing means seal the aperture at the distal end of the shell.

34. In a method as set forth in claim 29 wherein

one end of the core is provided with a covering and the core is drawn through the aperture in the shell with the covering on the core and the covering on the core is removed after the core has been drawn through the aperture in the shell.

35. In a method as set forth in claim 29 wherein

a member is disposed in co-operation with the core to facilitate the insertion of the core into the aperture in the shell.

36. In a method as set forth in claim 35 wherein

the facilitating member is withdrawn from the core after the core has been inserted into the aperture in the shell.

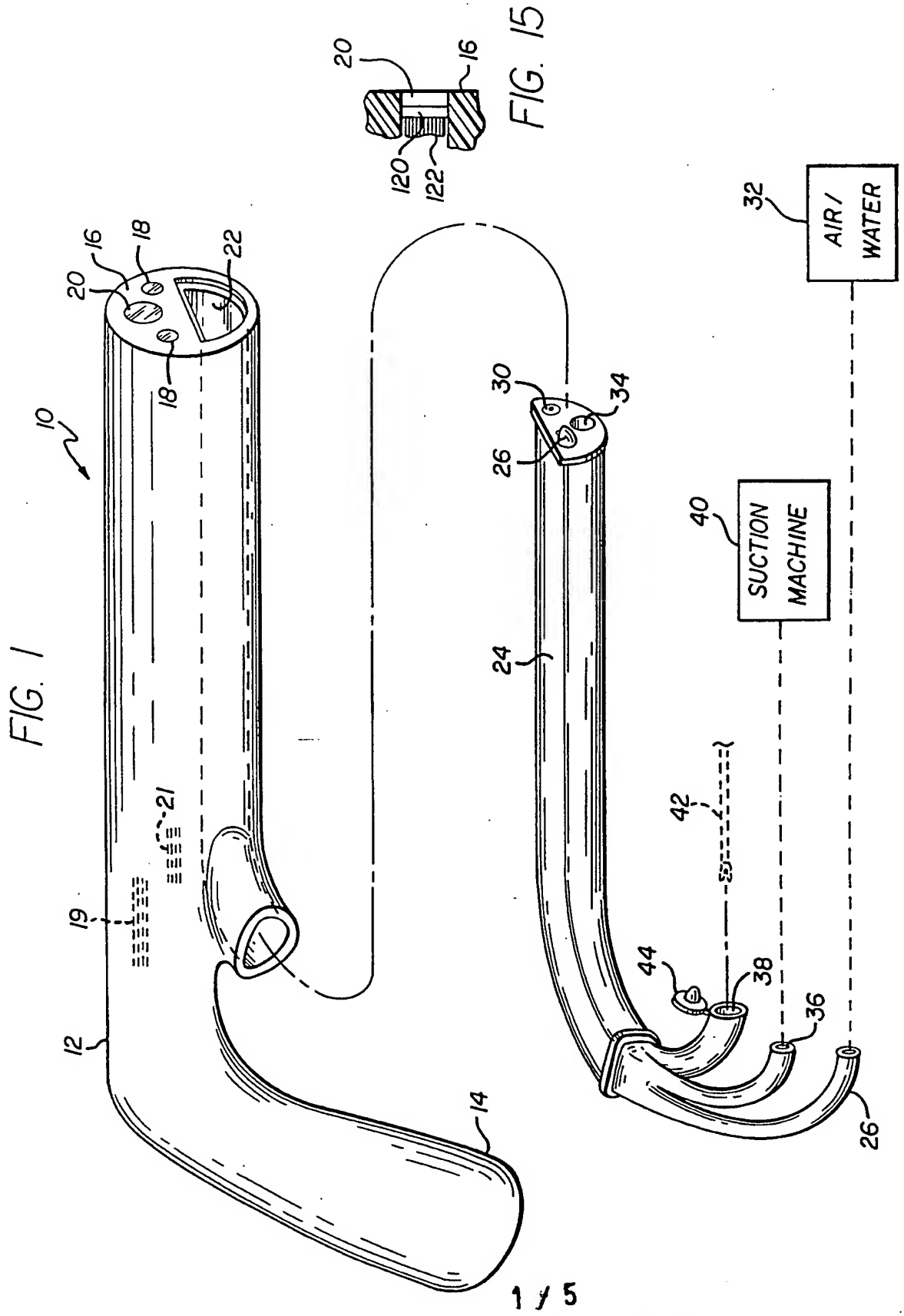
FIG. 1
FIG. 15
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36
38
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42
44
120
122
AIR/
WATER
SUCTION
MACHINE

FIG. 2

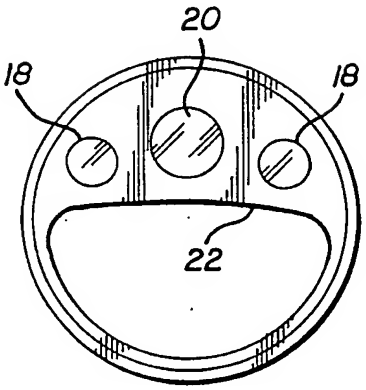


FIG. 3

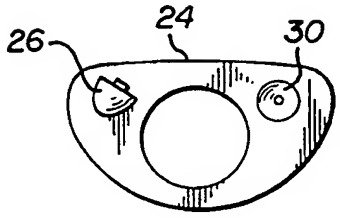
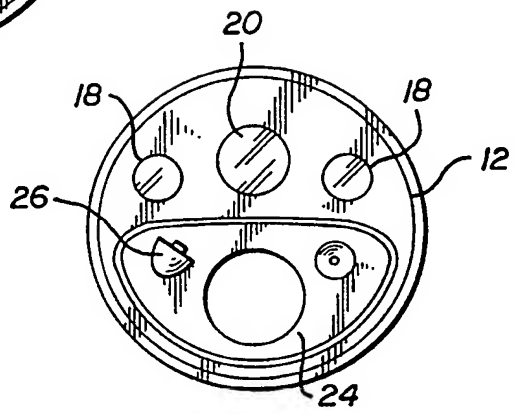


FIG. 4



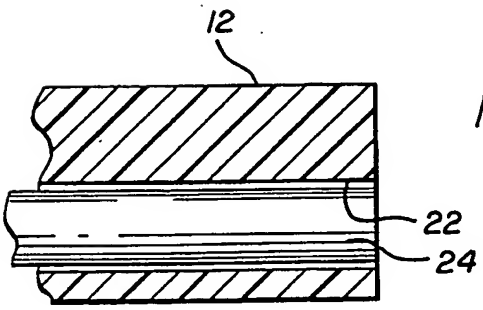


FIG. 5A

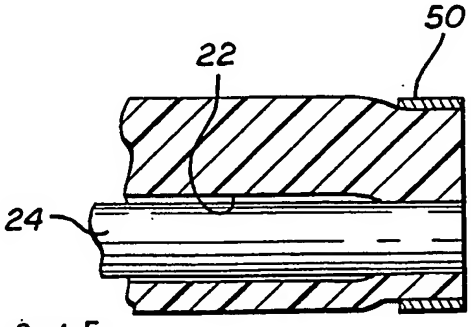


FIG. 5B

FIG. 6A

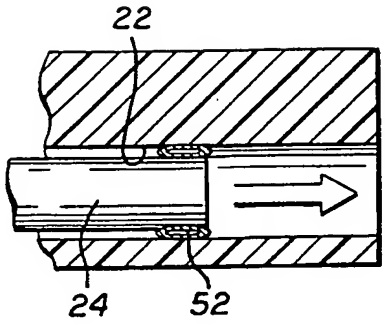


FIG. 6B

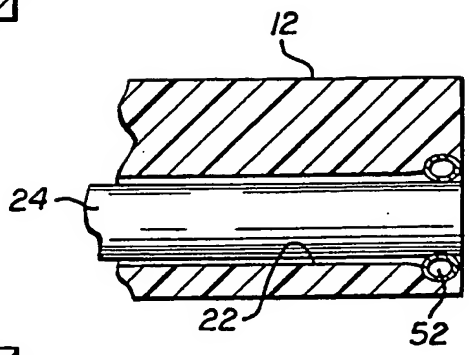


FIG. 7A

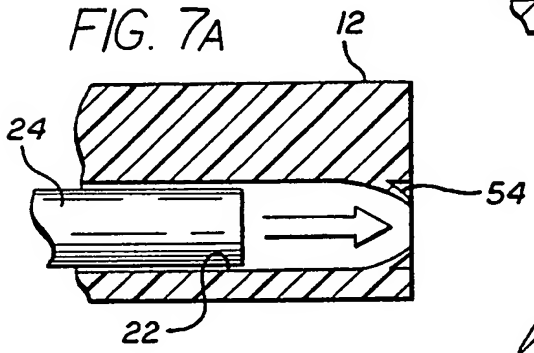


FIG. 7B

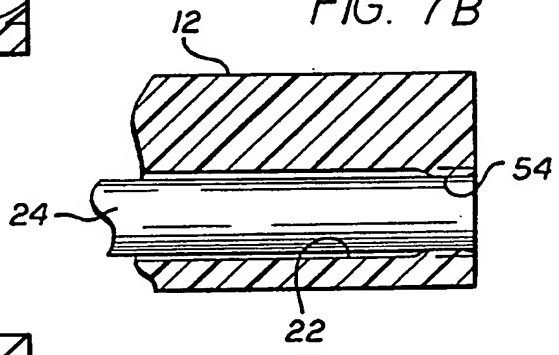


FIG. 8A

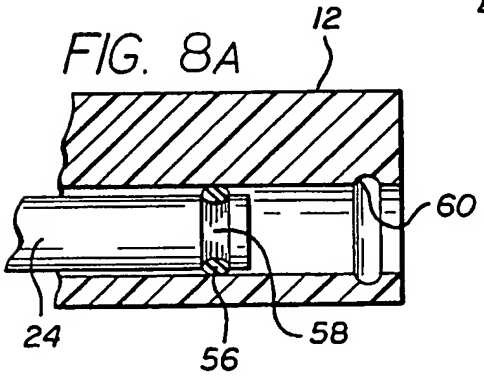


FIG. 8B

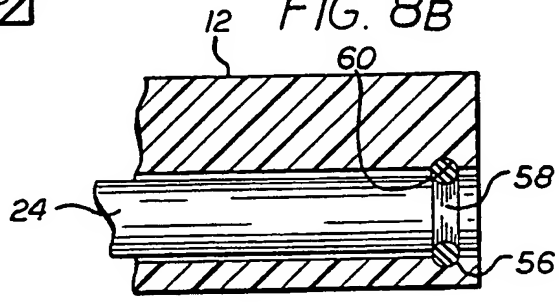


FIG. 9A

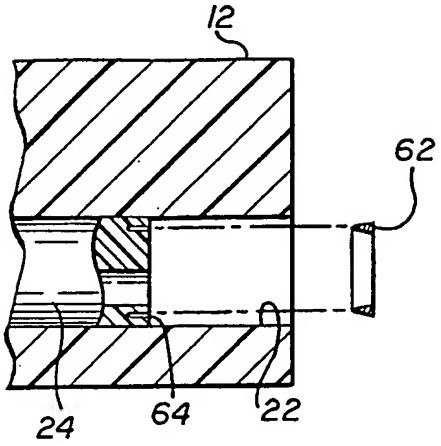


FIG. 9B

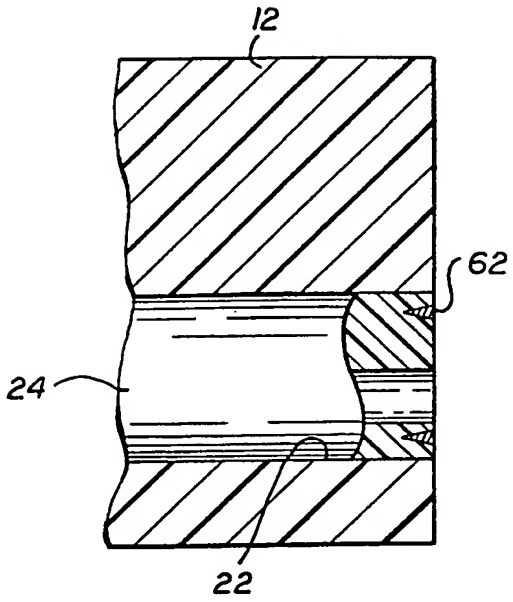


FIG. 10A

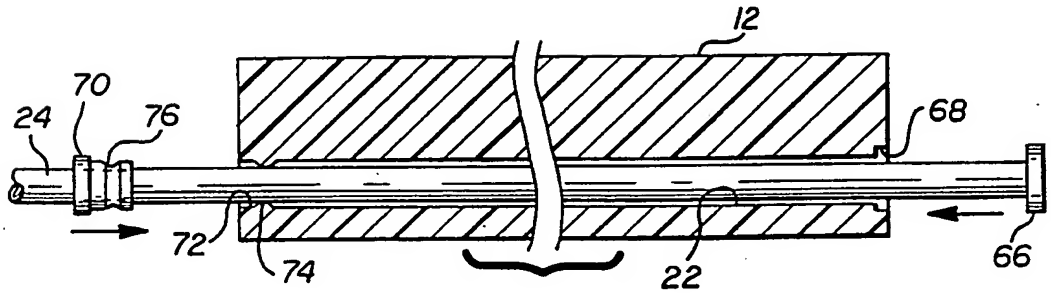


FIG. 10B

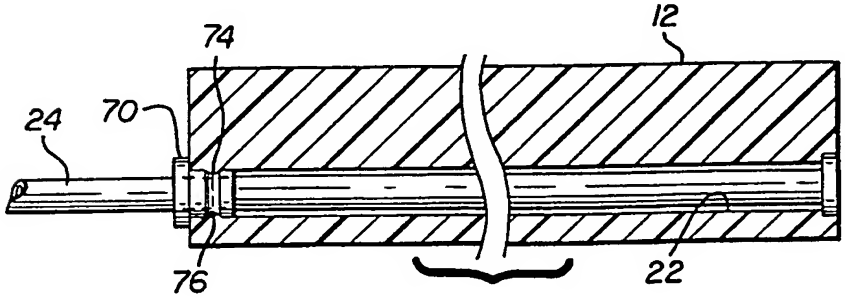


FIG. 11

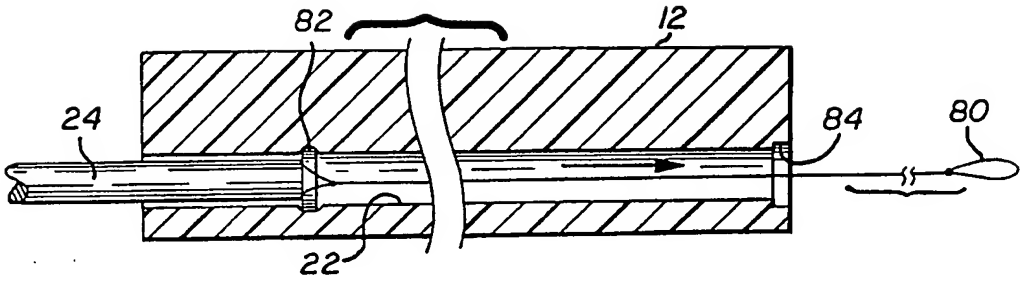


FIG. 12

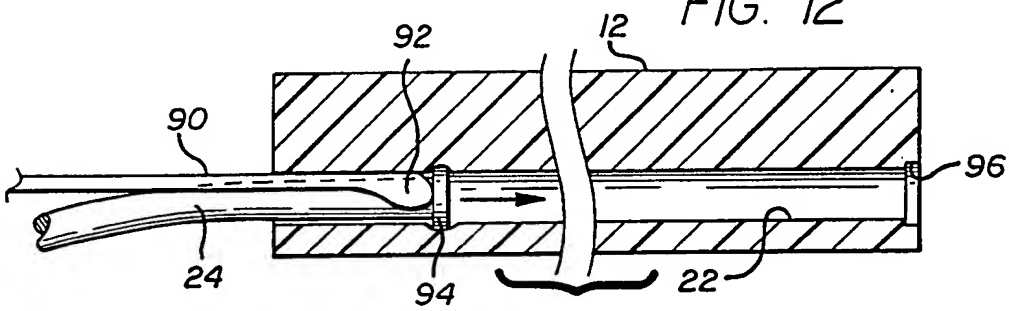
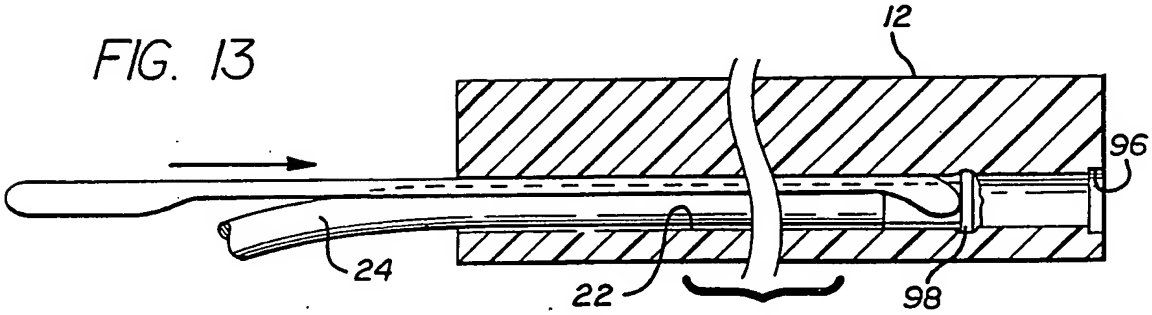


FIG. 13



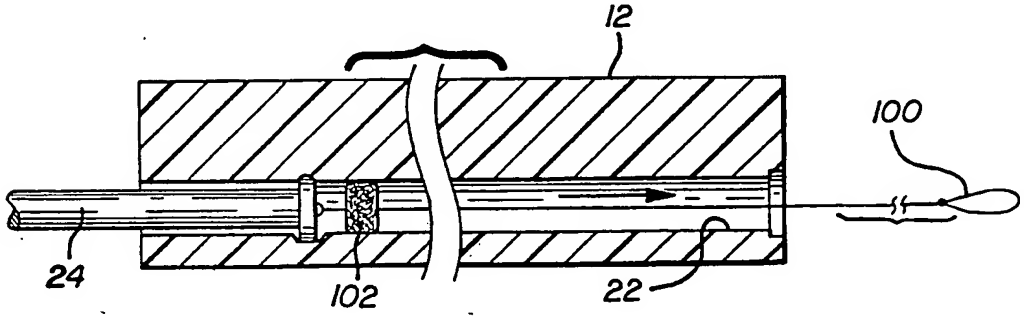


FIG. 14

INTERNATIONAL SEARCH REPORT

Intern Application No
PCT/ 94/06526

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A61B1/12 A61B1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US,A,4 991 565 (N.TAKAHASHI ET AL.) 12 February 1991 see the whole document	1-5,15,16 6-8,10,11,13,17 23,29
Y	DE,A,42 20 701 (OLYMPUS OPTICAL CO. LTD.) 4 February 1993 see column 22, line 27 - column 23, line 13; figures 1-49	6-8,10,11,13,17
A	US,A,4 991 957 (N.SAKAMOTO ET AL.) 12 February 1991 see column 15, line 38 - line 58; figures 40-47	1,6,10,15,23,29

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 September 1994	17 10. 94
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer Hunt, B

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INTERNATIONAL SEARCH REPORT

Inten[redacted] Application No
PCT/[redacted]94/06526

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,2 072 430 (BIO-ANALYTICAL LABORATORIES INC.) 24 September 1971 see page 13, line 5 - line 23; figure 6 ---	1,6,10, 15,23,29
A	WO,A,89 01797 (SURGICAL DYNAMICS INC.) 9 March 1989 see page 11, line 11 - page 12, line 4; figures 13-17 ---	1,6,10, 15,23,29
A	EP,A,0 230 751 (WELCH ALLYN INC.) 5 August 1987 see abstract; figures 1-5 -----	1,6,14

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INTERNATIONAL SEARCH REPORT

[redacted]ormation on patent family members

Intern. Application No
PCT/[redacted]94/06526

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		JP-A-	5146396	15-06-93
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[redacted]rmation on patent family members

Intern[redacted]l Application No
PCT/[redacted]94/06526

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0230751		JP-A- 62189042	18-08-87